PATENT ABSTRACTS OF JAPAN

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(54) ULTRAVIOLET-ABSORBING AND HEAT-INSULATING GLASS

(57)Abstract:
PURPOSE: To provide a glass with the durability, wear resistance, etc., remarkably improved by laminating a multilayer film including a noble-metal thin film on the surface of a transparent glass substrate and then applying a silicone hard coat through a primer coat contg. a fluorescent brightener and a UV absorbent.
CONSTITUTION: A multilayer film including at least one layer of a noble-metal thin film is laminated on the surface of a transparent glass substrate, and then a synthetic-resin primer soln. contg. dissolved flurescent brightener and UV absorbent is applied, heated and cured. A silicone hard coat soln. obtained by dissolving a siloxane prepolymer in org. solvent is then applied, heated and cured, the process is repeated, and a UV-absorbing and heat-insulating glass is obtained. This glass having a relatively high visible light transmittance and capable of sufficiently securing a visible field is used as the window, transparent heating element, electromagnetic wave shielding body, etc., for the building and vehicle with the comfortableness remarkably improved.

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cisely.
*** shows the word which can not be translated.
the drawings, any words are not translated.

AIMS

aim(s)]
aim 1]Lamination membrane formation of the multilayer film which contains one or more layers of
cious-metals system thin films at least on the surface of a transparent glass substrate is carried
, Subsequently, ultraviolet absorption heat insulating glass which covers with applying and carrying
heat cure of the silicone series hard court solution made to dissolve a siloxane prepolymer in an
anic solvent after applying and carrying out heat cure of the synthetic resin system primer liquid
ch carried out dissolution addition of a fluorescent brightener and the ultraviolet ray absorbent
by one, and is characterized by things.
aim 2]The ultraviolet absorption heat insulating glass according to claim 1 with which a multilayer
containing one or more layers of said precious-metals system thin film is characterized by being
ielectric, a precious-metals system or the alloy system and a metal system, sequential lamination
dielectric, or 3 thru/or 7 layer membranes that change in the repetition lamination.
aim 3]Claim 1, wherein said precious-metals system thin film is Ag, Au, Cu, Pt, or its alloy system,
ultraviolet absorption heat insulating glass given in 2.
aim 4]The ultraviolet absorption heat insulating glass according to claim 2, wherein dielectrics of
multilayer film are Si, Ti, Sn, aluminum, Cr, SUS, Ta, Zn, In, SiC and an oxide of these alloys, a
ide, and a nitrogen-oxides film.
aim 5]The ultraviolet absorption heat insulating glass according to claim 1, wherein said synthetic
in system primer liquid is an acrylic solution containing a silicone component.

anslation done.]

TAILED DESCRIPTION

tailed Description of the Invention]
01]
dustrial Application]This invention is heat ray shielding glass with a tunic which covers a solar
ct solar radiation and which is mainly used for windowpanes, such as vehicles, such as a car, and
uilding, Since it has ultraviolet-rays shielding performance while easing with [of direct sunlight]
and being able to make amenity improve, it is related with the useful ultraviolet absorption heat
ulating glass which can prevent degradation by the ultraviolet rays of an interior material.
02]
scription of the Prior Art]The composition of a dielectric / silver / dielectric is conventionally
posed as an article which intercepts solar energy, has the high transmissivity of a visible range as
heat reflective glass used in order to mainly reduce cooling load, and low radiate glass which
es heating efficiency, and has high reflection in an infrared region. For example, at JP,63-
3043,A, not less than 60% of infrared reflecting object article is proposed for visible light
nsmissivity by ZnO /Ag/ZnO /Ag/ZnO from the substrate. At JP,2-111644,A, the heat insulation
inated glass of the neutral color tone is proposed by ITO /Ag/ITO /Ag/ITO.
03]For example, as a method of covering ultraviolet rays, the method of coating with ZnO is
mmon to a substrate, and the ultraviolet absorption board which mixed the ultraviolet ray
orbent to the substrate is also proposed.
04]
oblem(s) to be Solved by the Invention]Since the heat ray shelter article and infrared reflecting
ct article containing a silver system film which was mentioned above reflect solar energy and
iant energy, in respect of cooling load reduction and space heating load reduction, it is
matically effective, but. Since adhesion strength fell while a silver system film deteriorates easily
ecially to moisture and hygroscopic surface moisture, and silver condenses with moisture and
roscopic surface moisture and stopping fully demonstrating shielding performance, it was required
be unable to use it as a single plate but to process to doubling or a double layer. Since the
elding effect over ultraviolet rays was not enough, for giving an ultraviolet-rays shielding effect, it
ded to be used as the glass laminate.
05]For giving this in an ultraviolet absorption board since there is no effect of heat ray reflection
infrared reflection, it is necessary to laminate the above-mentioned reflection film, and cannot be
d by a single plate on this substrate. Furthermore, these days, the influence of the ultraviolet rays
ozone layer depletion is becoming important with effective use of solar energy, and, in addition to
solar control which is effective use of the conventional solar energy also from this point,
raviolet-rays cover is important.
06]While the above-mentioned silver system multilayer film composition maintains high visible light
nsmissivity as solar control, since a heat ray and infrared reflection performance are high, are used
ndantly at object for construction, heat-insulating-glass [for vehicles], low radiation glass,
nsparent heating element, and electromagnetic wave cover etc., but. Since a silver system film
eriorated remarkably with moisture, such as humidity, there was a problem that sufficient
furance was not obtained even if it laminates the protective film of remarkable thickness. Handling
ay / that humidity and moisture need to be managed / which needs to be as short as possible /
ict] was difficult for time until it cannot use it as a single plate from a point of adhesion, but it
st process to doubling or a double layer and it performs these processings from a durable point.

[0007]Although a ZnO film is common as an ultraviolet-rays screen and commercialization is made, since endurance [especially as opposed to / since orientation is carried out pillar-shaped and it is very easy to ionize / medicine] is remarkable and a ZnO film's is weak when ultraviolet-rays shielding performance is raised, the place used is limited remarkably. For this reason, by the object for vehicles, the problem that it could not be used unless it processes to doubling or a double layer was in the structural row.
[0008]
[Means for Solving the Problem]This invention is made in view of such a point, and Sufficient heat ray shielding performance, For example, it has ultraviolet-rays shielding performance in a layered product which uses at least a precious-metals system thin film which has infrared reflection performance, for example, a silver system film, skillfully acrylic resin and silicone series hard coating resin by lamination combination ******. Since remarkable improvement, such as low endurance, abrasion resistance, etc. which are the above-mentioned problems, is obtained, Though it is a multilayer film which contains a precious-metals system thin film at least, it can fully be used as a single plate, And a structural row which can reveal enough [being simultaneous and] a function of ultraviolet-rays cover, heat ray cover, and infrared reflection in which performance sufficient with just each composition was not obtained is provided with ultraviolet absorption heat insulating glass with high endurance by a useful single plate for vehicles.
[0009]Namely, this invention carries out lamination membrane formation of the multilayer film which contains one or more layers of precious-metals system thin films at least on the surface of a transparent glass substrate, Subsequently, ultraviolet absorption heat insulating glass which covers with applying and carrying out heat cure of the silicone series hard court solution made to dissolve a siloxane prepolymer in an organic solvent after applying and carrying out heat cure of the synthetic resin system primer liquid which carried out dissolution addition of a fluorescent brightener and the ultraviolet ray absorbent one by one, and is characterized by things.
[0010]And ultraviolet absorption heat insulating glass with which a multilayer film containing one or more layers of said precious-metals system thin film is characterized by being a dielectric, a precious-metals system or the alloy system and a metal system, sequential lamination of a dielectric, or 3 thru/or 7 layer membranes that change in the repetition lamination and which was mentioned above. Ultraviolet absorption heat insulating glass mentioned above, wherein said precious-metals system thin film is Ag, Au, Cu, Pt, or its alloy system. Ultraviolet absorption heat insulating glass mentioned above, wherein dielectrics of said multilayer film are Si, Ti, Sn, aluminum, Cr, SUS, Ta, Zn, In, SiC and an oxide of these alloys, a nitride, and a nitrogen-oxides film.
[0011]Ultraviolet absorption heat insulating glass which is characterized by said synthetic resin system primer liquid being an acrylic solution containing a silicone component further again and which was mentioned above is provided. Having made heat ray cover and infrared reflection into a multilayer layered product of a dielectric / silver system alloy film / dielectric here, For example, visible light transmissivity is high by laminating five layer systems of ITO / silver / ITO / silver / ITO to a transparent substrate, and it is because heat ray cover with it and an infrared reflecting film are obtained from near-infrared rays. [remarkable reflectance of an infrared region of long wavelength and] [high]
If it is infrared reflection, since a tin oxide film by spray method or a CVD method also has high transparency and is excellent also in endurance, for example, it is good, but the characteristic is inferior compared with the above-mentioned silver system.

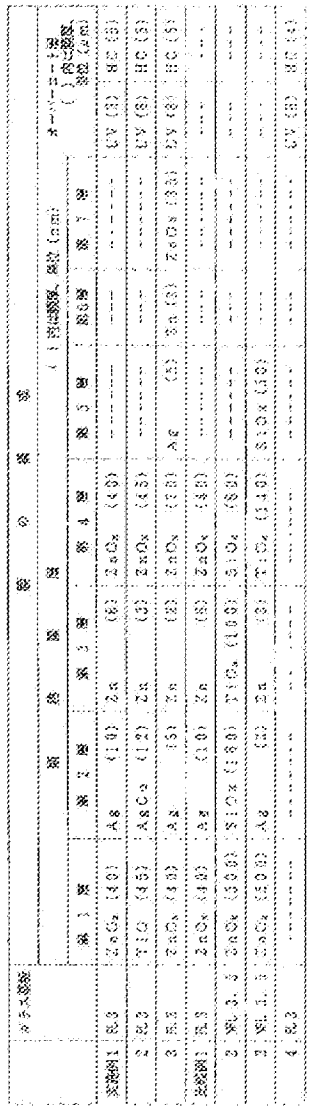
[0012]Although there are titanium nitride etc. which are the usual solar control films in some which stopped visible light transmissivity low, that characteristic is low compared with a silver system, and in order for a silver system layered product to be this purpose, it excels most. It is considered as an acrylic primer coating film which dissolved a fluorescent brightener and an ultraviolet ray absorbent as an ultraviolet-rays screen and which mainly contains a silicone component, In order that the endurance of a precious-metals system multilayer film, such as the above-mentioned silver system, especially moisture resistance, chemical resistance, and abrasion resistance might improve substantially, it was presupposed by doing in this way that it carries out by applying a silicon system hard court to this.
For example, it is because it is what is hard to be referred to as a ZnO film which is amphoteric oxide

ng remarkably weak to especially an acidic solution, and being able to use it for it by a single plate
a case where this ultraviolet-rays screen is laminated with a ZnO film by methods, such as weld
g and vacuum evaporation.

13]Furthermore at this invention, it is the refractive index 2.0 from a transparent substrate
ferably. About 40 nm of transparent dielectrics of a grade, It is the refractive index 2.0 from about
nm of transparent dielectrics or a transparent substrate about about 10-15 nm of silver system
s, and refractive-index 2.0. About 40 nm of transparent dielectrics of a grade, About 10-15 nm of
er system films, and refractive index 2.0 About 70-80 nm of transparent dielectrics of a grade,
out 10-15 nm of silver system films, and refractive index 2.0 It covers to about 400 nm of
nsparent dielectrics of a grade, That we decided to coat an acrylic primer containing a silicone
mponent which carried out dissolution addition of a fluorescent brightener and the ultraviolet ray
orbent, and to carry out silicon system hard coating further, Thickness constitution of this level
heat ray cover and infrared reflection, As a result of using thin film interference, visible light
nsmissivity is the conditions which become the highest. And in order to be because heat ray
er, infrared reflection, and ultraviolet-rays cover become enough and to fully satisfy each
elding performance, Not less than 65% of visible light transmissivity, 60% or less of solar
nsmittance, emissivity of 0.15 less than, and 10% or less of transmissivity of 370 nm are desirable,
l they are not less than 70% of visible light transmissivity, 55% or less of solar transmittance, and
issivity 0.1 more preferably. It is [the following and] 370 nm in 5% or less of transmissivity.
14]Furthermore, these days, although comparatively high transmissivity is given to reducing
oling load by a method of covering the whole solar energy with visible light transmissivity in which
ar control is comparatively low and Sun Belt Low -E which reduces cooling load is mainly provided
warm places, In this case, correspondence with multiple glass of the above-mentioned dielectric /
er system is made, and shielding performance of ultraviolet rays is comparatively low. Especially
h a warm background, a request to ultraviolet-rays cover is high, a demand on the above-
ntioned glass with ultraviolet-rays cover by a single plate is large, and this invention serves as a
y effective means to these.
15]Next, as a substrate, as long as quality of organicity of minerals is also transparent, of course,
y may be good and colorlessness or coloring may be sufficient as them. It cannot be
remphasized that it can be used as various sheet glass products, such as multiple glass or
inated glass, from the first that it can be used by a single plate.
16]
nction]As mentioned above the ultraviolet absorption heat insulating glass of this invention, By
forming the primer coat which carried out dissolution addition of a fluorescent brightener and the
raviolet ray absorbent to the lamination formed body which comprises the dielectric etc. which
tain one or more layers of precious-metals system thin films at least, and performing a silicon
tem hard court to it as a protective film further, By the lamination formed body which comprises
dielectric etc. which contain one or more layers of precious-metals system thin films at least, a
it ray reflex function, These both that reveal an infrared reflex function and reveal an ultraviolet
elding function and an endurance protective film function by acrylic coating and the silicon system
d court containing the silicone component of the ultraviolet ray absorbent dissolution by
nbining skillfully. KATSUTO [it has endurance sufficient by a single plate, and / especially / the
ndary of ultraviolet / visible both fields] very sharply etc., It is what satisfies ultraviolet-rays
er, heat ray cover, and an infrared reflex function, considers it as transparent ultraviolet
orption heat insulating glass, is excellent in humidity-proof nature, abrasion resistance, chemical
istance, etc., and can be used by a single plate as an object for the exterior without spoiling an
ical property, visible light transmissivity is comparatively high, and view reservation can fully be
formed and provides the useful ultraviolet absorption heat insulating glass which boils amenity
rkedly and makes it improve as a window for construction or for vehicles.
17]
ample]Hereafter, an example explains this invention concretely. However, this invention is not
ted to the starting example.
mple 1 size abbreviation 300mm x300mm and a float glass (floor line3) about 3 mm thick Neutral
ergent, It sets so that the target of the zinc and silver which have been set in the vacuum

chamber of DC magnetron sputtering system may be countered and it can go and come back to the upper part, after washing one by one and drying with a water rinse and isopropyl alcohol, After deaerating the inside of said tub by below abbreviation $5x10^{-6}$Torr with a vacuum pump next, introducing argon gas and oxygen gas (100 : however, the flow rate of oxygen gas and argon gas should just be in the range of zero to 50:50.) in this vacuum chamber -- a degree of vacuum -- about -- to $2x10^{-3}$Torr, [hold and] The electric power of about 1.0 kw(s) was impressed to the target of said zinc, and the ZnOx thin film of about 40-nm thickness was formed as the 1st layer by conveying said sheet glass for the inside of DC magnetron reactive sputtering by oxygen gas by /min about 250 mm in speed in said zinc target upper part. After membrane formation is completed, the impression to a zinc target and supply of gas are suspended.
[0018]Next, setting sheet glass in said vacuum chamber, introduce argon gas 45cc in said vacuum layer, and a degree of vacuum is held to abbreviation $3x10^{-3}$Torr, By impressing the electric power of about 0.1 kw(s) to said silver target, and conveying the inside of DC magnetron sputtering by argon by /min about 800 mm in speed in said silver target upper part, The Ag film of about 10-nm thickness was made into the 2nd layer on the ZnOx membrane formation surface of said sheet glass, and membrane formation lamination was carried out. After membrane formation is completed, the impression to a silver target and supply of gas are suspended.
[0019]Next, setting sheet glass in said vacuum chamber, introduce argon gas in said vacuum layer, and a degree of vacuum is held to abbreviation $3x10^{-3}$Torr, By impressing the electric power of about 0.1 kw(s) to said zinc target, and conveying the inside of DC magnetron sputtering by speed about 1600 mm/min in said zinc target upper part, the Zn thin film of about 6-nm thickness was made into the 3rd layer on Ag membrane formation surface of said sheet glass, and membrane formation lamination was carried out. After membrane formation is completed, the impression to zinc and supply of gas are suspended.
[0020]In said vacuum layer, setting sheet glass in said vacuum chamber Next, argon gas and oxygen gas. (-- however, the flow rate of oxygen gas and argon gas -- 100 : What is necessary is just to be in the range of zero to 50:50.) -- introducing -- a degree of vacuum -- about -- to $2x10^{-3}$Torr, [hold and] The electric power of about 1.0 kw(s) was impressed to the target of said zinc, and the ZnOx thin film of about 40-nm thickness was formed as the 4th layer by conveying said sheet glass for the inside of DC magnetron reactive sputtering by oxygen gas by /min about 250 mm in speed in said zinc target upper part. After membrane formation is completed, the impression to a zinc target and supply of gas are suspended.
[0021]Next, after taking out glass with a tunic from said vacuum chamber, film masking of the field where a tunic is not laminated is carried out, After being immersed in the ultraviolet absorption nature acrylic primer solution beforehand prepared on condition of the following 1 and pulling up at the rate of a /sec grade about 0.15 cm, it dried about 30 minutes at about 120 **, and the ultraviolet absorption film (UV) of about 8 micrometers of thickness was formed. Subsequently, after being immersed in the silicon system hard court solution prepared on condition of the following 2 and pulling up at about 1 cm/sec in speed, heat cure was further carried out about 30 minutes by about 140 ** after desiccation about 30 minutes by about 120 **, and about 5-micrometer hard court protective film (HC) was formed.
[0022]By the above, multilayered film lamination glass as shown in Table 1 was obtained.
[1, ultraviolet absorption nature acrylic primer solution] 350 g of cyclohexanone and 495 g of propylene glycol monomethyl ETERU used as a solvent are stuck on an agitator and a 1000-ml round bottom flask with a reflux condenser, and 55 g of acrylic BR-85 resin (made by Mitsubishi Rayon) is supplied, stirring at ordinary temperature. Fluorescent brightener UVITEX-alumnus (made by Ciba-Geigy) 2g and ultraviolet ray absorbent TINUVIN327(made by Ciba-Geigy)9g are added continuing stirring furthermore, it applies for about 30 minutes by an oil bath, temperature up is carried out to about 95 **, and it holds for about 30 minutes, and is made to dissolve thoroughly.
[0023]Subsequently, after stopping warming and falling to ordinary temperature, about 100g acrylic modified silicone resin OS-808A was added, the stirring dissolution was carried out, and the ultraviolet absorption nature acrylic primer solution for glass spreading was obtained. This ultraviolet absorption nature acrylic primer solution was transparent, and was about 9% of solid content, and about 600 cP of viscosity.

a silicon system hard court solution] 100 g of methyl triethoxysilane and 10 g of 3-
cidoxypropyltrimetoxysilane are stuck on an agitator and a 500-ml round bottom flask with a reflux
ndenser. Add and warm 0.04 g of phthalic anhydride at about 40 ** with a water bath, and it is
solved, then, weakly basic colloidal silica solution SNOWTEX C (the product made from the Nissan
micals.) The mean particle diameter of about 15 micrometers and 100 g of SiO_2 content were
led about 20%, it reacted [about] at about 40 ** on about the 5th, and about about 1100 number
rage molecular weight by GPC (the Toso make, ULC802A) and the constituent of about 30% of
id content were obtained.
24]145 g of isopropyl alcohol was added to this, it condensed with the ultrafilter (made by Nihon
lipore) of the cut off molecular weight 1000, and about about 1200 number average molecular
ght by GPC and the constituent of about 22% of solid content were obtained.
25]About 0.1 part grade addition of the dicyandiamide was carried out as a curing catalyst at this
nstituent, and the silicone series hard coating solution was obtained. About the obtained
ltilayered film lamination glass, visible light transmittance (380-780 nm), About light reflectance
0-780 nm) and solar transmittance (340-1800 nm), it is 340. It asked for the optical characteristic
a type recording spectrophotometer (made by Hitachi), JISZ8722, and JISR3106, respectively. It is
) if attached to ultraviolet absorption performance. The transmissivity of 370 nm of the type
ording spectrophotometer estimated.
26]It is what was made as [contact / this field / furthermore about the abrasion resistance by
verse examination, insert what put six broadcloth cloth #40 on /cm^2 and the cylindrical bottom 5
in diameter 0.1 kg of load, and / a film surface], After making it go back and forth 5000 times by
)-mm stroke, viewing estimated the state of the film surface. Next, after said specimen is
nersed into the 1-N solution of hydrochloric acid at ordinary temperature for about 6 hours, about
acid proof test, see and judge a membranous degradation state among chemical resistance, and
ut an alkali resistant test. Degradation is [what looked at the membranous degradation state,
ged by JISR3221 and was not seen for degradation, respectively as for most O seals, and x seal]
arly conspicuous after a specimen is immersed in a 1-N sodium hydroxide solution at ordinary
nperature for about 6 hours.
27]Furthermore about moisture-proof degree performance, visual evaluation of the surface state
er storage will be carried out to 50 **90% of environmental test in a plane for one day, two days,
days, ten days, 20 days, and 30 days, and O shows that the fault of a spot etc. is not seen and
ws it by x seal except it. Fully being able to use it by a single plate, and having high visible light
nsmissivity, and revealing the outstanding ultraviolet-rays cover, heat ray cover, and infrared
er so that more clearly than Table 2 and drawing 1, it has the outstanding amenity, and has
asion resistance, corrosion resistance, weatherability, and endurance, and the ultraviolet
orption heat insulating glass which becomes usable as windowpanes, such as a car and a building,
l expected aims at was obtained.
28]By the same method as two to example 3 Example 1, the multilayer film shown in Table 1 and
h of its thickness are obtained, it carries out by the same evaluation methods with the measuring
thod etc. which were shown in Example 1 in the film constitution, and the result is shown in Table
DC magnetron sputtering by argon and an ITO thin film formed the AgCu thin film so that it might
ome predetermined thickness to argon by DC reactivity magnetron sputtering of oxygen in very
all quantities with an ITO target.
29]The single plate article which has the obtained multilayer film was ultraviolet absorption heat
slating glass in which each physical properties, such as an expected optical property which was
cellent like Example 1, respectively, are shown.
30]
ble 1]



[0031]
[Table 2]

	可視光透過率	可視光反射率		日射透過率	日射反射率		UV透過率 (%)			55℃、95%RH						トラバース試験			密着性
	Tv (%)	ガラス面 Rg (%)	膜面 Rf (%)	Ts (%)	ガラス面 Rgs (%)	膜面 Rfs (%)	350 nm	370 nm	380 nm	1日	3日	5日	10日	20日	30日	(500回)	1N HCl	1N NaOH	
実施例1	70.6	10.0	8.3	50.4	21.3	22.4	0	0	0.1	○	○	○	○	○	○	○	○	○	○
2	65.8	17.6	22.5	45.6	30.9	33.5	0	0	0	○	○	○	○	○	○	○	○	○	○
3	71.0	9.8	8.5	47.6	35.3	23.9	0	0	0.1	○	○	○	○	○	○	○	○	○	○
比較例1	71.6	5.5	6.9	50.9	19.6	24.6	36.1	53.6	64.3	×	×	×	×	×	×	×	×	×	×
2	74.0	10.2	10.5	55.9	25.3	17.8	0.7	5.7	24.3	○	○	○	○	○	○	○	×	×	×
3	68.8	12.3	14.5	46.9	17.2	13.4	0.2	1.7	13.2	×	×	×	×	×	×	×	×	×	×
4	83.5	7.2	7.3	63.0	6.7	6.8	0	0.1	0.3	○	○	○	○	○	○	○	○	○	×

32]By the same method as comparative example 1 Example 1, as shown in Table 1, membrane nation lamination of the 4th layer was carried out from the 1st layer. However, said ultraviolet orption film and said hard court protective film are not formed. The obtained multilayered film ination glass is not absorption of ultraviolet rays, humidity-proof nature, and a thing that expected s at undesirably with abrasion resistance and chemical resistance, as shown in Table 2 and wing 1.

33]Lamination membrane formation of a SiOx film, a TiOx film, and the SiOx film was carried out the ZnOx film after 500-nm lamination by the sputtering technique on the comparative example 2

glass substrate. With the SiO target, the SiOx thin film formed membranes so that it might become predetermined thickness for DC reactivity magnetron sputtering by oxygen to be also with a Ti target, as for RF magnetron sputtering by argon oxygen, and a TiOx thin film. However, said ultraviolet absorption film and said hard court protective film are not formed.

[0034]As shown in Table 2, expected does not aim at the obtained multilayered film lamination glass undesirably [chemical resistance].

Lamination membrane formation of an Ag film, Zn film, a TiOx film, and the SiOx film was carried out for the ZnOx film after 500-nm lamination by the sputtering technique on the comparative example 3 glass substrate. However, said ultraviolet absorption film and said hard court protective film are not formed.

[0035]As shown in Table 2, expected does not aim at the obtained multilayered film lamination glass undesirably [humidity-proof nature, abrasion resistance, and chemical resistance].

Mask one side with a film at comparative example 4 glass substrate, and it is immersed in the ultraviolet absorption nature acrylic primer solution prepared on condition of the above 1. After pulling up at the rate of a /sec grade about 0.15 cm, it dried about 30 minute by the abbreviation 120 ** grade, and the ultraviolet absorption film (UV) of about 8 micrometers of thickness was formed. Subsequently, after being immersed in the silicon system hard court solution prepared on condition of the above 2 and pulling up at about 1 cm/sec in speed, heat cure was further carried out about 30 minute by about 140 ** after desiccation about 30 minute by about 120 **, and about 4-micrometer hard court protective film (HC) was formed.

[0036]Since the obtained multilayered film lamination glass has not given insulation efficiency though natural as shown in Table 2 and drawing 1, expected does not aim at it. However, absorption of ultraviolet rays, humidity-proof nature, and in respect of abrasion resistance and chemical resistance, it can be satisfied. As mentioned above, obtain a cascade screen as shown in Table 1, carry out in the film constitution by the same measuring method as Example 1, and the same evaluation methods, and as shown in Table 2, respectively, the result. the ultraviolet absorption heat insulating glass of this invention being markedly boiled synthetically in respect of versatility, and it excelling, and each comparative example as compared with these each example, For example, since ultraviolet-rays shielding performance, heat ray shielding performance, and infrared reflection performance cannot fully be satisfied simultaneously, To the desired characteristic, it cannot say that humidity-proof nature and at least 1 of chemical resistance and abrasion resistance are enough undesirably as for especially the durable performance to use it as a single plate that it is hard, but is hard to say that it is enough with desired durable performance.

[0037]

[Effect of the Invention]As mentioned above, perform the primer coat made to dissolve a fluorescent brightener and an ultraviolet ray absorbent in the laminated thin film layer which consists of dielectric membrane etc. which contain a precious-metals system thin film at least in this invention, and further as a protective film, By performing a silicon system hard court, by the dielectric or a precious-metals system laminated thin film layer, a heat ray reflex function. By acrylic coating and the silicon system hard court which make an infrared reflex function reveal and contain the silicone component of the ultraviolet ray absorbent dissolution, an ultraviolet shielding function, An endurance protective film function is made to reveal, and it can be considered as the ultraviolet absorption heat insulating glass with which it can be satisfied of ultraviolet-rays cover, heat ray cover, and an infrared reflex function, without having sufficient endurance, even if it uses it by a single plate, and spoiling an optical property by combining these both skillfully.

therefore, visible light transmissivity is comparatively high and view reservation provides the fully made ultraviolet absorption heat insulating glass which boils amenity markedly and is raised as the window for construction or for vehicles or a transparent heating element, an electromagnetic wave shielding body, etc.

[Translation done.]

SCRIPTION OF DRAWINGS

ief Description of the Drawings]
awing 1]It is a figure showing the spectral transmittance curve of Example 1 of this invention, and
comparative example 1 and the comparative example 4 which are conventional examples.

anslation done.]